XIV. THE POISONOUS SNAKES OF PENNSYLVANIA AND THE TREATMENT OF SNAKE-BITES.

By M. Graham Netting

(Plates VIII–IX)

Introduction

Each summer finds an increasing number of campers enjoying the mountains and forests of Pennsylvania. This fact, coupled with the fact that there is no apparent decrease from year to year in our poisonous snakes, leads us to conclude that each season more persons are exposed to possible snake-bites with frequent fatal consequences. This paper has been prepared to enable campers to recognize our venomous snakes, and, thus, to avoid them. Since the treatment of snake-bites has undergone great modification, due to the introduction of Antivenin in recent years, references to this newest method of treatment have been included.

The three poisonous species mentioned in this paper are the only venomous reptiles which occur in Pennsylvania. The "Water Moccasin," to which our farmers constantly refer, is a harmless, albeit a bad-tempered, water-snake. The true Water Moccasin, or Cottonmouth, is a poisonous snake of the Southern States, which ranges from West Virginia to the Gulf. Furthermore, that consummate "bluffer," the Puff Adder, or Spreading Viper, is quite innocuous, although it does imitate poisonous snakes at times. I think that it would be well for the public to forget the misleading names, which have been applied to this harmless snake by persons who considered it poisonous, and to refer to it by its more prosaic, and more accurate name, the "Hog-nosed Snake."

Finally, I should like to invite campers to make use of the facilities of the Carnegie Museum at all times. This institution is anxious to serve nature-lovers whenever possible. Specimens of reptiles sent to the Museum will be identified and then either returned or added to our collections, as the sender desires.

ACKNOWLEDGEMENTS

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HOW TO RECOGNIZE A POISONOUS SNAKE

All of the venomous serpents of Pennsylvania belong to the group of pit-vipers, and are so named because they have a deep pit (see Pl. VIII, fig. 1) on each side of the head between the eye and the nostril. None of our harmless species has such a pit. All three species have eyes with elliptical pupils, similar to those of a cat; short, stout bodies; stumpy tails; and long fangs, which fold back against the roof of the mouth. All three have more or less triangular heads, but this character will not distinguish them from our harmless snakes, as some of these also have triangular heads. The only safe way to identify a poisonous snake in the field is to know the three species well enough to recognize them at a short distance. This is not so hard as it might at first appear, for two of the species can be recognized as soon as the rattles are seen, and the Copperhead, which has no rattle, is a strikingly marked snake.

GENERAL INFORMATION ABOUT POISONOUS SNAKES

Poisonous snakes are usually anxious to avoid human beings, and generally assume a defensive position only when startled, or too closely cornered to escape. I have yet to see one of them act in as truly terrifying a manner as the harmless Hog-nosed Snake, when it is trying to bluff an enemy. Of course, the temper of individual snakes varies greatly under different conditions, probably as much as that of human beings. The southern Cotton-mouth Moccasin is considered vicious-tempered by some writers, yet I have deliberately poked one of these snakes with a stick without making it noticeably angry.

The venom is injected into the victim by hollow teeth, or fangs, which are located in the upper jaw. Among the pit-vipers the fangs are erected as the snake strikes. Removing the fangs does not render

the snake harmless, for new fangs from the reserve supply soon replace those which have been removed. The tongue, or "stinger," plays no part in the injection of venom.

The venom is a viscid fluid of yellowish color, and is composed largely of proteins. It is produced by glands which are similar to the salivary glands in mammals. Dried venom retains its poisonous properties for many years. The venoms of the different species differ in their poisonous qualities and the quantity injected varies according to the size and age of the snake, and according to other conditions, such as the length of the period of fasting.

A venomous snake strikes most effectively when coiled. Careful observers of snakes distinguish between the "resting coil" and the "striking coil." A snake can strike without coiling, sometimes for about three-fourths of its length. From a striking coil a snake can strike for about one-half of its length, and in almost any direction, except backwards. The danger zone about a poisonous snake is a circle with a radius as great as the length of the snake. A snake does not leap at its prey or at its enemies. I believe that coiled rattlers generally rattle before striking, but the popular conception that the rattlesnake "is a gentleman, and always rattles before striking" is quite erroneous. When a snake is shedding its skin and its vision is temporarily obscured it may be expected to strike viciously at anything that comes too near. Furthermore, if a snake is stepped on or touched it strikes in the quickest possible fashion without warning and without attempting to escape. With the above exceptions, it must be admitted that the small number of cases of snake-bite in this region are due more to the retiring dispositions of our venomous snakes than to the watchfulness of those hundreds of campers, who all unknowing pass close to quiet yet deadly snakes.

A KEY TO THE POISONOUS SNAKES OF PENNSYLVANIA

1. No pit between eye and nostril.....Harmless snakes
   A pit between eye and nostril.....Poisonous Snakes, (see 2)

2. A rattle present.....(see 3)
   No rattle present.....Copperhead

3. Top of the head covered with small scales....Banded Rattlesnake
   Top of the head covered with large plates.....Massasauga

THE COPPERHEAD, (Pl. VIII, fig. 2)

Agkistrodon mokasen (Beauvois).

This snake is variously called Highland Moccasin, Chunkhead, Kupferschlange, and Rattlesnake-pilot. It is the most widely distributed poisonous snake in Pennsylvania. I have records of its occurrence in more than half of the counties of the state, and I feel quite sure that it occurs in every county. Within the last ten years Copperheads have been killed within the city-limits of Pittsburgh. It is smaller (rarely exceeding forty inches in length) than the Timber Rattlesnake and its fangs are shorter, but its extreme abundance in populated sections renders it more dangerous. The saddle-shaped blotches of brown or red which extend down the back are a good field-mark for this species. This coloration makes the Copperhead easy to see when in the open, but very hard to distinguish when it is among fallen leaves. It feeds by night upon insects, small mammals, birds, and frogs, and hides by day under stones and logs in the woods and rocky pastures. The Copperhead frequents damp places, and is occasionally found swimming in streams. This snake gives birth to from four to ten young from the latter part of August to the first part of September. Young Copperheads have sulphur-yellow tails, which resemble maggots, and which may serve to attract their prey, and they are venomous at an early age. The Copperhead is sometimes confused with the harmless Milk- or House-snake, but it can be instantly distinguished from this smooth-scaled serpent by its keeled scales. From its feeding habits we must concede that this snake is economically beneficial.

THE MASSASAUGA, (Pl. IX, fig. 1).

Sistrurus catenatus catenatus (Rafinesque).

This snake is known to farmers in those isolated spots where it occurs as the Black-snapper, Swamp-rattler, or Pygmy Rattler. It is a rare snake in Pennsylvania and has been reported from only four counties; *i.e.*, Crawford, Mercer, Butler, and Allegheny. At one time it may have been commoner, but its range in this state was not much greater than at present. It certainly never occurred east of the Alleghanies in Pennsylvania. At present the Massasauga is found only in a few swamps in the above counties, and in the fields near

those swamps. This species may be recognized by the chain of dark blotches which extends down its back and by its small rattle. Some specimens are almost black. This snake reaches a length of more than three feet. It feeds primarily upon rodents, small birds, and frogs. Late in July or during August the females produce from five to nine young. The bite of this snake is rarely fatal, but it should receive the same careful treatment that would be administered in other cases of snake-bite.

THE BANDED RATTLESNAKE, (Pl. IX, fig. 2).

Crotalus horridus Linnæus.

This species is locally called the Timber- or Mountain-rattler. Males, and sometimes females, are frequently black in color, and females are often yellow. These color-phases have given rise to the names Black Rattlesnake and Yellow Rattlesnake. This snake is the only large rattler, which occurs in the eastern region, and is easily distinguished from the Massasauga by its size, and by the wide, dark brown, or black bands which cross its body. Some specimens reach six feet in length, but average specimens in Pennsylvania are less than four feet long. The Banded Rattlesnake is now extinct in the thickly-populated counties of the state, but it occurs in most of the mountainous sections, and I believe that it is increasing in numbers in such regions. It is not to be expected in flat, cleared regions of low altitude, nor in the moist situations which the Copperhead frequents. Large numbers hibernate together in "dens," and remain together during the mating-season in spring. During the summer they spread into the timber and along the ridges. On sunny afternoons in late summer I expect to find them along the rocky ledges among the huckleberry-bushes. This snake is not so common nor so wide-spread as the Copperhead, but its size is greater, its fangs are longer, and it appears earlier in the day. Unlike the preceding species it rarely, if ever, feeds upon frogs, salamanders, or insects. Its diet consists of mammals, mainly rodents, and, rarely, of birds. It is the most economically beneficial of our local venomous snakes, and I should dislike to advise its complete extermination. From seven to twelve young, about a foot long, are produced during September. Originally only provided with a button, they add about three segments to their rattles each year after the first. If the rattle becomes too long part of it breaks off, so

that little can be told as to the age of some of these snakes by the number of the segments.

SNAKE-BITE IN THE UNITED STATES

Statistics as to the number of cases of snake-bite annually are notoriously incomplete. Dr. Amaral says[1] that there are probably "over 1,000 cases of bites of poisonous snakes in this country every year, with a death-rate that runs from 10 per cent. in the Middle West to 25 per cent. in the South and 35 per cent. in the Southwest."

Although the mortality in some regions is low, all cases of snake-bite are painful, and frequently the ill effects are quite prolonged, if the old remedies are used. Infection of the wound is quite likely to occur, and the victim may be incapacitated for several weeks. Most writers seem to have overlooked the economic loss that is suffered by persons who are temporarily disabled.

The use of Antivenin greatly reduces the mortality. Of one hundred and fifty cases of snake-bite in Texas[2] during one year Antivenin was used in eighty-three cases and not used in sixty-seven cases. The mortality when Antivenin was used was 6 per cent., and when it was not used 34.3 per cent. All of the five persons who died, although treated with serum, would likely have been saved, if the Antivenin had been injected earlier and in sufficient quantity. The use of Antivenin hastens recovery greatly and reduces the possibility of infection.

PROTECTION AGAINST POISONOUS SNAKES

The following remarks are written to apply primarily to our local snakes and must not be taken as a safe guide for all parts of the country.

The majority of snake-bites are inflicted on the feet or legs. Shoes and leather leggings, or hiking-boots are ample protection, and one or the other is necessary for safety in the mountainous parts of the state. When climbing rocky ledges be careful to keep the face away from the rocks and either wear heavy gloves or climb without using the hands. The Copperhead and Timber Rattlesnake are apt to be found in such places. Never descend during the warm months into the sink-holes or rock-chimneys, which occur along some of our mountain-ridges. Copperheads are quite common in these moist, dark cavities.

[1]Harvard Alumni Bulletin, XXIX, No. 21, Feb. 24, 1927, p. 603.

[2]Amaral, Bulletin Antivenin Inst., I, No. 3, Oct. 1927, p. 80.

In the regions where snakes are plentiful do not put the fingers under a rock or log when turning it over, but use a stick for this purpose. In western Pennsylvania both the Massasauga and the Copperhead will strike as the log or rock is removed. In going through the woods step on top of a log and then down. One girl was bitten by a Copperhead near Pittsburgh because as she stepped over a log her foot came down beside the snake. Barefooted children should not run after dark through the woods or along dirt-roads. Copperheads wander about at this time, and frequently seek the warm dust of the roads. Do not wear "Oxfords" and silk-stockings in the woods.

Do not make pets of poisonous snakes. It is quite true that many dangerous snakes become tame in captivity, but even "tame" rattlesnakes should not be handled by inexperienced persons. After you have killed a poisonous snake be very careful of the head. For some time after the death of the reptile the jaws are capable of closing down and of driving the fangs into the flesh. If you wish to skin the snake, first sever the head from the body, keeping one foot on the head while you do this.

In general, wear your heaviest footgear when camping in the woods, keep your eyes open, and remember that in most instances snakes are just as anxious to avoid you, as you are anxious to avoid them.

A HISTORY OF TREATMENTS

From the earliest times human beings have searched for remedies for snake-bites. Among savage peoples today a variety of herbaceous extracts, frequently characterized by their foul odor, are in use. In our own country many varied treatments have been used. Chickens are split open and applied to the wound, gunpowder is piled on the wound and then touched off, the finger bitten is chopped off, cloths soaked in urine are applied to the wound, or large quantities of alcohol are administered. Some of these treatments are useless, although the victim may survive in spite of the treatment, and some of the above methods are more or less effective, but are cruelly drastic.

Until the development of anti-toxin there was no efficient remedy for snake-bites. Some years ago various agencies throughout the world began to prepare anti-toxins or serums for use in case of injury by the venomous snakes of their respective localities. Many Americans have visited the famous "Snake-farm" of the Government Institute of Serotherapy at Butantan, Brazil, which was established in

1897. Under the brilliant direction of Dr. Vital Brazil this Institute prepared large amounts of serum. Dr. Raymond L. Ditmars was instrumental in securing a small amount of this serum annually for use in the United States. Although this amount was woefully small, it effected the saving of human life on numerous occasions.

In 1926 the H. K. Mulford Company, with the coöperation of the United Fruit Company and Harvard University, established the Antivenin Institute, with laboratories at Glenolden, Pennsylvania, and sub-stations, for the collection of venom, throughout this country and at Tela, Honduras. Dr. Afranio do Amaral, thoroughly trained in the preparation of anti-toxin at the Brazilian "Snake-farm" came to this country to direct the work at the new laboratory. Dr. Amaral, after completing his task in a highly successful manner, has returned to Brazil, but he is retained as Consulting Director of the Antivenin Institute.

Antivenin has been prepared in quantity, duly approved by the United States Public Health Service, and is now available at hospitals and drug-houses throughout the country. It can be used against the bites of all the poisonous snakes in the United States, with the exception of the two species of Coral Snakes which occur rather rarely along our southern borders. A special serum is prepared for use in the case of livestock, but, if necessary, the regular Antivenin may be used. Every large children's camp in regions where poisonous snakes occur should have Antivenin in its medicine chest. If it does not have a supply on hand, I feel that the person in charge should be considered criminally negligent. Campers and tourists should carry a supply.

THE PREPARATION OF ANTIVENIN

At the various sub-stations snakes are "milked" by competent handlers. The venom obtained is mixed with glycerine or dried, then labeled, and shipped to the main laboratory. There it is dissolved, diluted, and injected into horses in increasingly large doses over a period of months. After about eight months the horses develop an antitoxin in their blood which neutralizes the effects of venom. Then, by a very humane method, a number of quarts of blood are taken from each horse. From the colorless part of this blood the serum is obtained, concentrated, sterilized, tested for potency, and packed with full directions for use.

I am advised that the Antivenin Institute will welcome visitors at

its Glenolden headquarters. Mr. Stadelman, who is in charge of the snake collection, will be glad to give demonstrations of the method of "milking" snakes, and to explain the preparation of Antivenin.

THE TREATMENT OF SNAKE-BITE

WHAT NOT TO DO.*

"Don't run or get overheated. Don't take any alcoholic stimulants. Circulation, increased by exercise or by alcohol, serves to distribute the poison much more rapidly through the body. Don't injure the tissues by injecting potassium permanganate, which is now known to be of no value as an antidote. Do not depend upon snake-bite "cures," or home-remedies commonly used. They are of no value. Do not cauterize the site of the bite with strong acids or the like."

WHAT TO DO IF ANTIVENIN IS NOT AT HAND.

"Apply a ligature or tourniquet a few inches above the bite. For this purpose use a rubber garter, a piece of small rubber tubing, a handkerchief, cord, or even a shoe-string. Do not bind the limb too tightly, but just tightly enough to retard circulation returning through the veins toward the heart. The sole object of the tourniquet is to delay absorption of the poison into the general circulation, but if it is applied too tightly or kept on too long, gangrene is likely to set in, with resulting destruction of the flesh in the affected area. It is important, therefore, to release the tourniquet every ten or fifteen minutes for about a minute at a time."

Resort to "incision and suction, both of which have been used in Texas in cases of bites inflicted by the Western Diamond-back Rattlesnake. Make a cross-cut incision at each fang-mark. For this purpose use a sharp clean knife or razor blade, and make the cut all the way through the skin, that is, about one-fourth of an inch deep and one-half an inch long. This allows some of the poisonous fluids to escape.

"The removal of toxic fluids may be increased by applying strong suction over these incisions. The suction may be done mechanically, if some apparatus, such as a breast-pump, is at hand. Suction should be kept up almost constantly until a physician takes charge of the treatment."

*Quoted from the "Directions for the Use of Antivenin (Nearctic Crotalidæ)" published by the Antivenin Institute of America.

TREATMENT OF SNAKE-BITE WITH ANTIVENIN.

If you are provided with Antivenin carefully read the instructions which come with every package containing the antidote and follow them literally without undue excitement. Do not wait for a physician, but apply the remedy yourself, or with the aid of a companion, but send for a physician at once. Fortunately Antivenin prepared by the Antivenin Institute of America can be obtained from hundreds of drugstores throughout the State of Pennsylvania.

It would be well for all people, who intend to camp in the woods, where there is danger of being bitten by a poisonous snake, before undertaking the excursion, to write to the Antivenin Institute of America at Glenolden, Penna., and obtain a supply of the remedy, as well as the literature which accompanied each package giving full directions for its employment, or to some druggist, who can supply the antidote and the directions for use.